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AQUATIC HABITAT INVENTORY, EVALUATION AND PLANNING IN THE BUREAU OF LAND MANAGEMENT: RECOMMENDED PROCEDURES.

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I. INTRODUCTION

In December, 1978, fisheries biologists from the Oregon State Office and the western Oregon districts met in Eugene to discuss, among other things, the Bureau manual directives for the inventory, evaluation and planning of aquatic resources. Comments from that session, plus additional comments from district personnel received after the meeting, were compiled and sent to the districts along with a request for recommendations for improvements. Using the recommendations, four biologists met in Portland and developed some suggested supplemental procedures to be used with the 6671 and 6672 manual sections. Nine of the eleven districts in Oregon and Washington had an opportunity to try the supplemental procedures. In addition, copies were sent to several other BLM offices for testing and comment.

A second meeting was held in December, 1979 in Portland at which biologists from the Oregon and Idaho state offices and nine of the districts reviewed the experiences with supplemental material. Responses were generally favorable to the concepts, although there were many recommendations for revisions. The Bureau is currently considering major changes in its planning system. It was the consensus of the Portland meeting that the aquatic manual sections on inventory, URA and planning should be updated. This reflected the opinions expressed earlier by an inventory task force which met in Washington, D. C. in December, 1979.

The following comments summarize the basic ideas developed by the Oregon biologists. The outlined procedures are not a final format, but are rather a general recommendation for consideration in any formal revision of the Bureau procedures. Agreement was not reached on all points, but, in general, the biologists felt the procedures outlined would provide the necessary guidance.

II. PURPOSE

The basic purpose for conducting inventories, monitoring conditions and providing management recommendations is the protection, enhancement and development of the aquatic resources within the overall management of public lands. While the Bureau does not directly manage wildlife species, its actions determine the amount and quality of wildlife habitat on public lands which, in turn, determines the quality and quantity of wildlife that depend upon the habitat.

A. Planning. Allocation of resources is principally through the planning process. The process provides all resources an opportunity to express needs which can be compared with the needs of other resources. Inventory is necessary to determine the extent of the resource, its condition and needs. It is only when good, current information is available that the biologist can adequately make recommendations.

B. Habitat Management Plans. The HMP process provides a method of making more detailed recommendations for management of wildlife habitat. Basic de-decisions on resource allocation are made in the planning process; in the HMP, which is essentially a single rather than multiple resource document, detailed planning, implementation and evaluation are carried out on the basis of needs identified in the inventory.

C. Monitoring. Congress has directed that the Bureau shall determine the impacts of its management on the resources on public lands. This requires a program of sampling and inventory on a continuing basis to see that the plans developed in the planning and HMP processes are being implemented and are achieving the desired results.

D. Environmental Assessment. Information is required that will permit making predictions of impacts and in developing management options in accordance with Congressional and Executive directives. This assessment may occur at any step in the Bureau program, or in its coordination with other agencies.

III. LEGAL AUTHORITY

The following are some of the principal legislative and executive acts that give direction and authority to the aquatic habitat program:

Fish and Wildlife Coordination Act, August 12, 1958 (82 Stat. 563)
National Wild and Scenic Rivers Act, October 2, 1968 (82 Stat. 906)
National Environmental Policy Act, January 1, 1970 (83 Stat. 852)
Endangered Species Act, plus amendments; December 28, 1973
Sikes Act, October 18, 1974 (88 Stat. 1369)
Federal Land Policy and Management Act, October 21, 1976 (90 Stat. 2743)
Federal Water Pollution Control Act (86 Stat. 816)
Clean Water Act, plus amendments, 1977 (33 USC 446, et. seq.)
Executive Order 11988, Floodplain Management, (42 FR 26951, May 25, 1977)
Executive Order 11990, Protection of Wetlands, (42 FR 26961, May 24, 1977)

IV. OBJECTIVES

There are several objectives, or end products, that should come from inventories. In a general sense, inventories should provide a description of the resource, show what management options are available, provide a method for evaluating the resource, and permit predictions of any changes resulting from management actions.

A. Resource present. The inventory should provide information on the species present and their habitat, and on the potential of the resource. For information to give an accurate description, it must include not only information taken through a field inventory, but also information from past inventories and from the literature to provide necessary comparisons on changes in productivity. In a real sense, the inventory should tell you not only what the current resource is, but also what it has been in the past, how it got to be what it is at the time of the inventory, and what the potential is in the future.

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B. Comparison of Resource. Some method of evaluation is needed, and should be obtainable from the inventory. The evaluation can show which areas are most productive, and which have important or unique properties. The evaluation permits comparison between areas, and between current conditions and potential conditions. It helps in setting priorities for further action.

C. Unique Species. Inventories should identify unique populations of wildlife, their distribution and habitat requirements. Current Federal, State and Bureau directives provide special protection for species which are categorized as endangered, threatened or sensitive. Inventory information is needed to provide the necessary special protection.

D. Interaction. Inventory information should show how the aquatic resource is interacting with other resources, and what impacts are resulting from other resource uses. In most areas, management is not single-use oriented so that a variety of resources are being utilized, resulting in impacts on the aquatic resources. Because of the high level of importance of water on most public lands, the aquatic resource receives the heaviest and most varied uses.

E. Congress, the President, and other agencies have developed guidelines and restrictions on activities on public lands. The inventory procedures should show if these mandates are being met, and if the standards or goals prescribed are being achieved.

F. While information obtained in an inventory is usually obtained for a specific purpose or objective, that information should be useable for any other Bureau activity, or for any other management or scientific need. By using proper procedures and techniques, the information can be scientifically sound making it useable in comparing with or analyzing with information from other sources.

V. INVENTORY NEEDS

A variety of data elements could be considered during an inventory. Many of them were discussed during the meeting. The range of data elements is extensive, a reflection of the complexity of the aquatic system. Management needs to be on an ecosystem basis, taking into account the total basin of an aquatic system. The entire basin feeds water into the aquatic system, bringing with it the materials picked up on and under the surface as the water flows downward out of the system. Activities that alter the normal flows and the nature of the material carried by the water have an influence on the aquatic system. Biologists must be concerned not only with the situation in a specific location, but must also consider these other influences within the basin that determine the quality and quantity of water entering the area of concern. Because of the need to consider the aquatic system within the ecosystem, there is considerable overlap in informational needs between fisheries and other resources. Many of the informational needs can be obtained from the inventories conducted by the other resources. Some of the questions the inventory seeks to answer are:

A. What is the basic resource? The basic resource is the stream course or lake basin, landform, water supply, and the associated flora and fauna, without any alteration by man. Essentially, it is the pristine habitat and fauna. The basic resource needs to consider the general landform and geologic type, since that determines in large measure the form of the water system, gradients, the nature and form of the smaller material in the stream, and the quality of water. It includes soil types which contribute to the quality of vegetation and the erodibility potential in the basin. The basic resource includes the water budget; the amount and form of water entering the system and how it moves through the system. The flora and fauna in the undisturbed habitat reflect these geologic, soil, hydrologic and climatic patterns having adapted to the conditions over the millenia.

B. What changes have occurred? Few areas of public land remain unchanged. A variety of human activities has contributed to alteration of the basic resource. An inventory would consider how the aquatic system and its associated ecosystem have changed and what has brought about the change. This includes actual physical modification in the basin, such as construction, farming, timber harvest or mining; changes in flow patterns, as with dam construction or irrigation water withdrawals; and changes in species composition and abundance through harvest and the introduction of exotic forms.

C. What is the current condition? Based on the pristine condition and on the current potential of a resource, the inventory will take measurements to determine the current condition. The condition refers to the current quality of the habitat and the associated species compared to the potential for that particular aquatic system. Condition, as here used, is both a description of existing habitat and biotic components and a comparison of their status with the potential.

D. What are the trends? No system is static, since there is constant flux in the physical and biological elements. Some of these are short term, reflecting seasonal and annual changes in use, water supply or climatic conditions. The trend represents the average, long-term direction in condition; whether the amount and quality of the habitat, with associated biota, are improving, becoming less favorable or remaining in an overall static condition.

E. What activities and management practices are occurring? This would identify past and current BLM management on public lands. In addition, the need is for information on other activities occurring in a basin on state, private or public lands administered by other Federal agencies. While BLM's management options are on public lands, it is necessary to know what other activities are influencing the habitat in order for suitable management decisions to be made. The same is true of state management of wildlife resources; BLM does not manage the species but its activities, through impact on the habitat, has a major influence on populations present. It is important to include in the inventory information from the State on utilization of the wildlife by the public and the management practices being conducted by the State.

F. Are there items of special note? Congress has established several categories of wildlife and resource areas that are to be given special attention. These include endangered and threatened species, wilderness areas, areas of critical environmental concern, wild and scenic rivers, and national heritage program lands and waters. The inventory procedure should provide for the identification and evaluation of habitat and populations that would qualify for special concern under legal mandates.

G. What is needed to protect or improve the resource? Partly this question will be answered by the evaluation which should demonstrate where problems exist in the system. However, many problems are site-specific, such as road failures, mine tailings, saline springs, etc., which can only be identified during inventories. Inventories provide identification of needs, and provide the basic information needed to plan for the resource to overcome the problems or limitations.

VI. INVENTORY SCHEDULES

The question is raised as to how often does the aquatic resource need to be inventoried. Given limited time and funding, where should the inventory begin? It was the general consensus that each stream or lake should be inventoried at least once every ten years. The degree of inventory is flexible, and is influenced by the needs for the information and the amount of change that has taken place.

The initial inventory needs to be quite complete, giving a detailed description of the resource present, conditions, status of the ecosystem, and the associated flora and fauna. Water quality, vegetation, fish population and distribution, hydrology, and habitat factors need to be measured and evaluated. This initial inventory then serves as the baseline for referencing subsequent work.

Ideally, a monitoring program will be developed. This monitoring will include physical habitat, water quality and fish populations. The most efficient system is to select sampling and index areas where all components can be monitored on a regular basis. Then, when water quality samples are taken, a check can be made of physical habitat conditions and fish populations. This not only provides an efficient method of monitoring conditions, but helps to show the relationship between changes in different aspects of the aquatic resource.

Reinventory would then be conducted on a ten-year cycle. If changes in the inventory section were minimal, the reinventory would be mostly to see what fish populations are present and their abundance and distribution, and to check on erosion or other problem areas to ascertain changes that have occurred. Most of the baseline information would not have to be repeated. If a regular monitoring program had been conducted, little or no reinventory would be needed. If major alterations had occurred in the basin, it will probably be necessary to redo the whole inventory.

The inventory schedule is to a large degree determined by administrative needs. The preparation of planning documents, development of environmental assessments, and the implementation of management decisions will generally dictate which waters will be scheduled for inventory. Within an area, however, it may be necessary to select waters to be inventoried when it is not possible to do all waters present. The following is a suggested priority list:

Suggested inventory priority list:

1. Waters officially designated as critical habitat.
2. Waters containing endangered, threatened or sensitive species.
3. Areas of Critical Environmental Concern; those with relict populations.
4. Habitats for commercially important species, or used by them for reproduction.
5. Waters with important populations of game fish.
6. Waters with game fish, or used by game fish for spawning or rearing.
7. Waters with populations of non-game fish.
8. Waters used seasonal by fish but lacking resident populations, or waters which have a significant influence on a higher priority water.

In the W.O. IM 79-391, three levels of aquatic inventory were specified. In the Task Force Report of December, 1979, four levels were suggested by the participants for both aquatic and terrestrial inventories. The four levels were:

inventory levels:

1. Level 1: Existing information and field verification. Used for non-site specific actions, and for low and medium intensity EARs.
2. Level 2: Extensive inventory incorporating remote sensing (including aerial photographs) and sampling to estimate key variables over large areas. To be used as a minimum level of information for broad scale land-use planning where no high wildlife values or controversial wildlife issues are identified.
3. Level 3: Site-specific sampling of wildlife habitats and associated species covering the season or seasons expected to yield the best wildlife data. To be used for land-use planning and is minimal for site-specific land-use planning, major EARs, and for areas including high wildlife values or areas of controversial wildlife issues.
4. Level 4: Intensive sampling to include all seasons for one or more years. Used for baseline monitoring, in-depth analysis of specific major management problems, and for development and management of habitat management plans.

During our discussions, biologists recommended that five levels be identified. In general, the five levels were:

Biologists recommended Levels:

Level 1: Existing information and field verification. Used for broad, non-site-specific actions.

Level 2: Level 1 plus identification of amount and distribution of major habitats. Done by low-intensity field inventory and remote sensing (including aerial photography). Used for broad-scale land use planning and low intensity EARs where no high wildlife values or controversial wildlife issues are identified.

Level 3: Level 2 plus extensive on-ground inventories of all habitats; intensive inventory of high priority habitats. Used in land-use planning and medium intensity EARs.

Level 4: Level 3 plus intensive inventory of all involved wildlife habitat, covering all seasons of use. To be used for HMPs, site-specific actions, high intensity EARs, and where controversial wildlife issues are involved.

Level 5: Level 4 plus long-term data collection or detailed studies of limited scope. Used for intensive research and for long-term monitoring studies.

VII. INVENTORY PROCEDURES

At the present time, we are using the 6671 inventory procedures under a cooperative agreement with the ODFW and USFS. All agree that the 6671 format no longer provides all the information called for in current planning and environmental assessment efforts. It does not adapt well to different levels of inventory. A variety of formats have been used as substitutes or supplements. During the past year, biologists in Oregon tried out some supplemental forms, again with variations. Despite the various tests, and the discussions held, no agreement was reached on the proper format. There was a general feeling that, perhaps, format didn't really matter. The key issue really is having data that presents the information in a uniform, comparable manner, and that provides the information to the degree and in a form that can be used in meeting land management responsibilities. The exact method of acquisition is probably less important than uniformity of elements needed if all can use the same information. The Task Force, in Washington, D.C. in 1979, discussed using a handbook system for providing technical direction, and using the manuals for establishing policy guidelines. The handbooks would provide several option methods for gathering information. The biologist could then select the most suitable methods. Regardless of option used, minimum guidelines would have to be met. There was considerable sentiment in the December biologists' meeting for such a system. Based on the level of information needed, resources available and use for which data is needed, the biologist would be able to select the appropriate inventory technique and would not be restricted to a single system. In this summary, no single system will be presented.

1. Other BLM Programs. Most of the inventories conducted are an outgrowth of the need to have input into, or correlate with other BLM programs. At the present time, the grazing and timber ESs, and the push for energy development largely dictate the kind, schedule and intensity of wildlife inventory efforts. At the same time, these other resources can be an important source of information. Many of the inventory elements, such as geologic type, climatic and water quality information, soil types, vegetative type and condition, and

erosion potential will be available from other resources when they are fully operational. The Bureau uses SVIM as their basic soil and vegetation inventory technique. The aquatic inventories can easily fit into the SVIM format, using soil and vegetative information, when that information is properly acquired. One of the difficulties has been the use by districts of a modified SVIM method that is not based strictly on soil and vegetative inventories, but is forage-oriented. This modified method is not useable in wildlife and aquatic inventories, necessitating a duplication of effort. A second difficulty often encountered is the failure to separate the riparian areas as unique soil and vegetative communities; in omitting this difference, an important aspect of the SVIM inventory for aquatic resources is lost. By using SVIM properly, and that includes the aquatic biologists, the information can be readily interchangeable between resources, and will save time and effort by having it in a format all resources can use.

2. Other Agencies. Wildlife is in a unique situation in BLM planning. BLM manages the habitat, but does not own the animal resources. Therefore, all efforts must be coordinated with the state wildlife agencies. This includes inventory. Inventory efforts should be coordinated with state inventory efforts. All state law requirements for permits must be met.

Land patterns are seldom such that all the habitat for an animal population is under BLM management. Because of movements of fish and wildlife, management must be also coordinated with other land owners and land managers. This is true also of inventories. The current cooperative agreement on inventories with the ODFW and USFS is a reflection of the need for such close cooperation.

3. Existing Information. For all levels of inventory, the starting place is the development of a library of existing information. There are several sources of such information:

a. State fish and game agencies; includes inventory and species information, information on sport and commercial fishing efforts; species introductions and plantings; status and location of sensitive fish populations; current management programs and long-term plans. Material can be found in annual reports, file material, and publications, and through contacts with appropriate biologists and managers.

b. Other land management organizations and governmental units. Many agencies and governmental organizations acquire and use wildlife information, or information of value in fisheries work. For example, the EPA conducts regular compliance checks of discharges and water quality; under its 208 program, water quality and stream condition information has been gathered throughout the U.S. and is being used to develop long-term water management programs. The USFS carries out an extensive fisheries and water quality management program. With lands often adjacent, their inventory and planning information may be of value. State and local planning groups, Federal agencies such as SCS, and USGS, carry out

inventories and monitoring programs that can provide information for fisheries. Regular reports, planning documents and special publications may be available.

c. Universities: Universities often provide a ready source of information. Many conduct regular research programs that acquire information related to fisheries. Many have fish collections and libraries that are valuable resources. Research organizations and cooperative fish and wildlife units are often attached to universities and can provide publications and research information.

d. Libraries: State and local libraries, university libraries and the libraries of various research and management agencies can be a ready source of information. The Department of Interior maintains and extensive library in Washington, D.C., that can make publications available, or can acquire those it does not carry.

e. Computer Searches: Several organizations now offer computer searches for information on particular topics. Publications are coded according to key words, usually related to topics covered and location of publication work. A computer search is initiated by having the computer search through its files for publications matching the key words on location and topic. It then prepares a printed list of the publications meeting the key word criteria, often with annotation on the contents.

f. Conversations with local residents, and historical information from historical societies, journals, etc., can be a valuable source of background information and trends.

4. Contracting. Because of manpower ceilings, it is often difficult to acquire sufficient personnel to conduct inventories needed for planning and other purposes. Increasingly, recommendations are to contract inventories to other organizations. Preference will be given to state fish and game agencies on such contracting. Any contract should be detailed in outlining the types of information, methods of acquisition, methods of summary and analysis.

5. Remote Sensing. Two types of remote sensing are being used, satellite imagery and aerial photographs. The major difference is scale. With the satellite imagery, the work can only be done on a gross level because of the large scale. It can be used quite successfully for showing overall ecosystem patterns, including vegetative distribution, erosion areas, topographical problems, channel characteristics, channels stability and concentration areas of human activity. Many of the satellites provide imagery on a regular schedule, permitting observation of season changes and, by comparing through years, trends.

Aerial photography can accomplish many of the same things as the satellite imagery. However, because of its much finer scale, it allows for more detailed analysis. Stream structure, gradient, channel character, shading, and other aspects can be read off the aerial photographs. A fairly good description of the physical characteristics can be made from such photographs. Again, seasonal

variability and trends can be plotted on the photographs. The technique has been very successful in following trends in riparian vegetation.

With both aerial photography and satellite imagery, some ground-truthing needs to be done. Key elements on the photographs need to be cross-checked in the field to make certain that the interpretations of the photographs are accurate. This is generally done by selecting representative points and then comparing a field visit to the conditions shown on the photograph. For use with stream interpretation, a data base needs to be already established before the remote sensing can function well. There needs to be a base of previous inventories, including water quality and fish information, to use for comparison. The remote sensing information is much less complete without this comparative data base.

6. Field Inventory. No single method of inventory is going to be discussed here. Instead, several options will be mentioned.

   a. Gross ocular: in the gross ocular method no measurements are made. Instead, the situation is given a cursory field examination and the individual components estimated. The observation may be done on foot, from a vehicle, aircraft or boat. Specific problem areas or items of interest are noted and are located accurately; some of these may be given careful examination to help develop recommendations.

   b. Transect method: The transect method, as outlined in the BLM Tech Note, is a refinement of the gross ocular method. An ocular estimate is used for most of the survey. However, at selected intervals, a representative site is selected. A transect is run across the stream and accurate measurements made of the individual data components. This transect then can be used as an accurate data base of referencing estimates of the various components as found in the rest of the stream.

   c. Random Measurements: This is a statistically valid method of conducting the inventory. The entire stream is seldom measured. Instead, portions of the stream are measured in detail. The portions are known area sections selected in a statistically random method. The information gathered is then extrapolated to the stream as a whole.

   d. Oregon form: attached to this summary is a modified copy of the form we discussed at the meeting, together with some brief comments on the individual components. This form is really an outline of the information to be gathered without restricting the method of acquisition. It is useable in any of the other methods indicated. The degree of accuracy and the depth of the information depends upon the needs of the investigator, and can be adjusted without changing the basic outline.

7. Monitoring. BLM is required by law to monitor its activities on public

lands. Monitoring of the fishery resource requires monitoring of the basic chemical, physical and biological components. During inventories, representative sections should be identified for monitoring. In the monitoring areas, sample sites should be selected for monitoring water quality, fish populations and physical habitat. The most useful method seems to be one which combines a regular water quality program with seasonal or annual fish monitoring, and at least an annual check on physical conditions. The three components are best checked at the same time for better correlation of the information. This monitoring provides an excellent data base and helps to show trends and any major changes.

8. Studies and Research. Monitoring in BLM is usually coupled with studies since it involves more than a short-term check on the resource. However, monitoring and studies are not actually the same thing. In monitoring, checks are made at a regular interval on conditions in the resource. With studies, a greater effort is made to determine what impacts different practices have on the resource. Sampling locations and schedules are determined by specific data needs. The studies may be short-term or long-term. Research is a more detailed examination of the resource management, and is designed to elucidate basic principles operating in the management of the resource and the impacts on that resource from actions with associated resources. There is overlap among studies, monitoring and research; the basic differences are in terms of time of project, the selection of data elements and the scheduling of work.

9. Integration. A key element in all inventory is the need to view the inventory in terms of the overall ecosystem. The aquatic resources do not exist independent of all other resources. As a land-based resource, the aquatic resource depends upon the overall situation in the land-base on which it depends. An inventory may describe the conditions in a particular location, but the analysis must be done in terms of the overall basin. Inventories should be developed that will reflect information of the basin in terms of the overall ecosystem.

10. Inventory Forms. During the review, three inventory forms were considered. One was a modified stream inventory form, the second was a still water inventory form, and the third was a form for recording aquatic projects identified during the inventory. Copies of all three forms, with a brief explanation of each, follow. These are more outlines than actual inventory forms, but they can be adapted to field use. All can be used for any level of inventory.

STREAM INVENTORY FORM

A. SITE IDENTIFICATION

1. NAME OF WATER_____ 2. INVENTORY LOCATION_____

3. BASIN_____ 4. COUNTY_____ 5. RESOURCE AREA _____ 6. P.U._____

7. TWP_____ RGE_____ SECT____8. LAT_____LONG_____ 9.STREAM ORDER____ 10.CLASS_____

11. INVESTIGATORS_____12.DATE_____ 13 TIME_____ 14 CODE #_____

B. STREAM CHARACTER

CHANNEL WIDTH: 15.MEAN_____ 16.MAX._____ FLOW: 17.NOW____18 MAX___19.MIN___ 20.MEAN_____

POOL: 21.MEAN AREA, W___X L____ 22. MEAN DEPTH_____ 23.MAX. AREA,W____ X L___ 24.MAX.DEPTH___

25. POOL_____% 26. RIFFLE_____% 27.GLIDES_____% 28.RUNS___% 29.RAPIDS___% 30.CASCADES_____%

31.EXPOSED BEDROCK____% 32. BOULDERS OVER 3'____% 33. BOULDERS 1-3'____% 34.COBBLES_____%

35.RUBBLE_____% 36.COARSE GRAVEL, 1-3"_____% 37.SMALL GRAVEL, 0.1-1"_____% 38. SAND _____%

39. SILT_____% 40.TREE BOLES_____% 41.LIMBS_____% 42.OTHER WOODY_____% 43.OTHER_____%

C. GEOMORPHOLOGY

44. LANDFORM TYPE_____ 45. GEOLOGIC TYPE_____ 46.EROSION POTENTIAL_____

SLOPE: 47.RIGHT_____ 48. LEFT_____ ELEVATIONS: 49.START SURVEY_____50.END SURVEY_____

SOIL TYPE: 51.RIPARIAN_____ 52.UPSLOPE_____ 53. GRADIENT_____ 54.SINUOSITY_____

D.VEGETATION

RIPARIAN: 55. TYPE_____ 56. COMPOSITION_____

57. POTENTIAL_____58.CURRENT CONDITION_____ 59. TREND_____

60. AGE CLASS_____ 61. COVER____% 62.SHADE_____% WIDTH 63.MEAN_____ 64.MAX._____

UPSLOPE: 65. TYPE_____ 66. COMPOSITION _____

67. CURRENT CONDITION_____ 68. TREND_____ 69. COVER_____

AQUATIC VEGETATION: 70. EMERGENT_____ 71. SUBMERGENT_____

E. WATER QUALITY

AIR TEMPERATURE: 72.CURRENT_____ 73. MAX.____ 74.MIN._____ 75. PRECIPITATION_____

WATER TEMPERATURE: 76. CURRENT_____ 77. MAX.____ 78. MIN_____. 79.OXYGEN_____ 80. pH_____

81. TSS OR TURBIDITY_____ 82.TDS OR CONDUCTIVITY_____83.COLIFORM_____ 84.OTHER_____

MACROINVERTEBRATES: 85.BIOMASS_____ 86. DIVERSITY INDEX_____ 87. SPECIES_____

88.STREAM CONDITION_____ 89. STREAM TREND_____

F. FAUNA

FISH: SIZE AND ABUNDANCE

90. SPECIES 91. STATUS 92. STOCKED 93. LENGTH/WEIGHT 94. POPULATION SIZE/METHOD 95. TREND

OTHER ANIMALS

96. AMPHIBIANS 97. REPTILES 98. BIRDS 99. MAMMALS 100. SPECIAL USE AREAS

SPAWNING AND REARING AREAS

101. SPECIES 102. LOCATION 103. AREA 104. CONDITION 105. TREND

G. HABITAT FACTORS

106. HABITAT TYPES _____ 107. STREAM STRUCTURE TYPES _____

108. CHANNEL STABILITY _____ 109. BANK STABILITY _____

HABITAT AND ACCESS PROBLEMS

110. LOCATION 111. PROBLEM 112. CAUSE 113. TREND 114. SIZE 115. RECOMMENDATION

EROSION AREAS

116. LOCATION 117. CAUSE 118. DEGREE OF PROBLEM 119. TREND 120. RECOMMENDATION

H. CURRENT USE

121. FISHING PRESSURE _____ 122. MAJOR SPECIES _____

123. OTHER USES AND IMPACTS _____

I. OTHER

124. SENSITIVE SPECIES _____ 125. ACEC AREAS _____

126. ACCESS:

127. COMMENTS:

EXPLANATIONS FOR STREAM INVENTORY FORM

1. Name of water being inventoried.
2. Location of water: give references for the beginning and ending of inventory that others could locate; give distance inventoried in yards, meters, kilometers or miles.
3. Basin: Major basin or drainage in which water is located.
4. County in which inventory conducted.
5. BLM Resource Area in whch inventory conducted.
6. Township, Range and Section of inventoried section; if length, use location of starting point of inventory.
8. Latitude and Longitude; use location of starting point of inventory.
9. Stream Order: stream order of section inventoried; if more than one order, so indicate.
10. Class: Stream class, based upon Oregon criteria.
11. Investigators: names of those conducting inventory.
12. Date: date of inventory; abbreviate months but do not use numbers for months. For example, 10 Oct 81, not 10/10/81.
13. Time: time inventory of the inventory form begun; use military time.
14. Code Number: Some states, or some BLM districts, have a code numbering system for streams; this space is for such code numbers.
15. Mean width of channel in inventory section.
16. Maximum width of channel in inventory section.
17. Current flow, in cubic feet per second (CFS).
18. Maximum flow, cfs; if unknown, give estimate.
19. Minimum flow, cfs; if unknown, give estimate.
20. Mean flow, cfs, if unknown, give estimate. Mean flow may be given for a particular season instead of for the year; if so, indicate on inventory form.
21. Average pool area, given as mean width times mean length.
22. Mean pool depth.
23. Maximum pool area: area of largest pool, given as width times length.
24. Maximum depth of pools in inventory section.
25.-30.: Description of stream flow characters; total should equal 100%.
    25. Percentage of stream section as pool.
    26. Percentage as riffle. For definition of riffle, see early discussions.
    27. Percentage as glides.
    28. Percentage as runds.
    29. Percentage as rapids.
    30. Percentage as cascades; include falls under cascades.
31.-43. Description of bottom composition. Because of woody material, totals may equal more than 100%
44. Give general description of landform type in inventory section; i.e., deep canyon, gentle rolling hills, steep headwall area.
45. Geologic type: major geological formations influencing landform and water supply.
46. Erosion potential: give calculated erosion potential or sediment yield potential, or give general summary of apparent conditions.
47. Give slope, as percentage, for right side of stream.
48. Give slope, as percentage, for left side of stream.

49. Elevation at start of survey.
50. Elevation at completion of survey.
51. Basic soil type in riparian areas.
52. Basic soil type(s) in upslope areas.
53. Stream gradient, as degrees or percent.
54. Sinuosity; sinuosity (amount of curvature) in the stream. Normally calculated by dividing stream section length by the direct distance.
55. Basic type of vegetation found in riparian area.
56. Composition: major plant species in riparian area; indicate whether grass, forb, shrub or major woody plant.
57. Potential riparian vegetative community, both in terms of composition and in potential development.
58. Current condition: current condition of the riparian vegetation.
59. Trend: trend in condition of riparian vegetation.
60. Age class: age class of riparian vegetation.
61. Cover: percentage of ground covered by vegetation less than six feet high.
62. Shade: percentage of stream shaded by vegetation and terrain between 10 a.m. and 5 p.m.
63. Width of riparian vegetation at present time.
64. Maximum potential width of riparian vegetation is allowed to develop completely.
65. Predominant vegetative type of upslope vegetation.
66. Composition of upslope vegetation, giving major species.
67. Current condition of upslope vegetation.
68. Trend of upslope vegetation.
69. Cover of upslope vegetation, for plants under six feet high.
70. Emergent aquatic vegetation, giving general statement on abundance and major forms.
71. Submergent vegetation; indicate general abundance and major forms.
72. Water temperature at time of inventory. If more than one measurement made, include them. Unless stated otherwise, temperature will be at start of inventory section.
73. Maximum temperature, if known; if possible, make estimate.
74. Minimum temperature; if known; can make estimate, if possible.
75. Precipitation: general levels of precipitation; may be broken down to snow or rain.
76. Water temperature at time of inventory; more than one may be taken. If other than at start of inventory, so indicate.
77.-78. Give values if known. An estimate may be used.
79. Oxygen measurements; if other than time of inventory, so indicate.
80. PH: if other than at time of inventory, so indicate.
81. Total suspended sediments, if measured; turbidity may be used if TSS values not available. Be sure to indicate units of TSS or turbidity.
82. Total dissolved solids or conductivity: If taken at other than time of inventory, so indicate.
83. Coliform: give as MPN per 100 ml; if taken at other than time of inventory, so indicate.
84. Give other water quality measurements made, as needed. Water quality may be summarized on appropriate bureau forms, then attached. Any water quality measurements must be tied to flow levels and habitat

conditions to be of value.

85. Biomass: generally given as grams/ft^2 or grams/M^2. Biomass indicates the amount of material present at the time of sampling; it is not interchangeable with productivity.
86. Diversity Index: indicate method used, numerical value, and rating. (high, low, etc.).
87. Species: indicate species composition, at least for major species, and indicate tolerance of those forms to stress.
88. Stream Condition: general comment on condition of stream; may use numerical rating from stream evaluation form.
89. Stream Trend: summarize the general trend in stream condition as shown by comparative inventories.
90. Species: indicate species of fish present.
91. For each species, indicate status, whether game fish, warm or cold water, whether threatened, endangered or sensitive; and whether anadromous or resident.
92. Indicate those fish which have been or are being stocked; those which are introduced but are not currently being stocked should be so indicated.
93. Where information is available, show lengths and weights; a summary of length and/or weights may be estimated.
94. Indicate population size, making sure to note units (numbers/area, etc.). Indicate how population size estimate was made (shocking, ocular, etc.).
95. What is the population trend for each species.
96.-99. indicate other animal species encountered during inventory or known to be users of the aquatic and adjoining areas.
100. Indicate special use areas (i.e., reproducing areas, cover, etc.) for other animal species.
101. Indicate species present; summarize table information for each species.
102. Location of spawning area in inventory section. This may be by actual location, or by summarizing the types of habitat in the inventory section used for reproduction.
103. The amount of spawning habitat available. Normally, will be given in area (such as 127 yd^2 of useable spawning gravel for salmonids) or as a percentage (27% of stream useable by redside shiners for spawning.)
104. General condition of spawning area in terms of its useability by target species.
105. Trend in condition of spawning area in terms of use by target species.
106. Basic habitat types available for use by fish; can be either gross or microhabitats.
107. Summarize degree and kinds of stream structure present.
108. Indicate general channel stability; channel stability rating may be used.
109. Bank Stability: summarize degree of bank stability. May be given as a numerical rating, or as a percentage of bank stable. If necessary summarize for both left and right banks.
110. Location of situations creating problems for fish; problems include access barriers, habitat degradation, or use conflicts.
111. Indicate nature of problem.
112. Summarize the causes of the problem, both historical and current.
113. Trend: indicate what has been and is the trend in the problem, whether conditions are remaining static, improving or getting worse.

114. Size: indicate general dimensions of problem.
115. Recommendations: make recommendations for overcoming problem. If more than one option is open, so indicate.
116. Give location in inventory area of places producing erosion into the water.
117. Summarize the causes of the erosion, indicating historical causes and current situation.
118. Give the dimensions of the problem.
119. Summarize past and current trends in the erosion problem.
120. Make recommendations for reducing or alleviating problem.
121. Summarize fishing pressure, both sport and commercial.
122. Give major species sought by sport and commercial fishermen.
123. Indicate other uses that are impacting the quality of the habitat in the inventory area. Indicate the nature of the use, the extent, and the problems it is creating. If possible, make recommendations for reducing or eliminating the problem.
124. Summarize those sensitive species for which special management consideration is needed. Officially listed forms must be included. If recovery efforts are underway, or if an HMP has been developed for the species, so indicate.
125. Indicate areas now qualifying or listed as ACEC. Summarize recommendations for ACEC aquatic areas, giving location, dimensions, and reasons for recommendation.
126. Summarize access to inventory area; attach maps as needed. If water quality sites or monitoring sites are identified during the inventory, indicate them here.
127. Comments: summarize inventory information, adding additional information as needed. Comments may be made on other resources (such as cultural resources, terrestrial wildlife) that would be of value to others. In comments, make general recommendations for management of the inventoried section of stream.

LAKES, PONDS, SPRINGS AND RESERVOIRS
INVENTORY FORM

NAME OF WATER_____ TYPE_____ BASIN_____ COUNTY_____

LOCATION_____ TWP_____ RGE_____ SECT_____ DATE_____

DISTRICT_____ RESOURCE AREA_____ PLANNING UNIT_____ TIME_____

SURVEYOR_____ STATION NAME AND LOCATION_____

INFLOW_____ OUTFLOW_____ AREA OF WATER_____

ADJACENT LANDFORM_____

ADJACENT VEGETATION_____

RIPARIAN VEGETATION

MAJOR PLANT SPECIES | CONDITION | TREND

FISH SPECIES

SPECIES | SPAWNING AREAS | REARING AREAS | MAJOR USE AREAS | POPULATIONS & TRENDS

PLANKTON

SPECIES PRESENT | POPULATION LEVELS & TRENDS | SEASONAL CYCLES

WATER QUALITY

DEPTH | TEMPERATURE | OXYGEN | CONDUCTIVITY | TURBIDITY | PH | OTHER

LIMITING FACTORS ON WATER QUALITY AND QUANTITY _____

_____

PRINCIPAL LAND USE_____

_____

USE OF WATER _____

COMMENTS/RECOMMENDATIONS _____

_____

DIRECTIONS
LAKES, PONDS, SPRINGS AND RESERVOIRS
INVENTORY FORM

Name: Name of body of water being inventoried.
Type: Whether lake, pond, spring, reservoir or other type of water.
Basin: Major basin in which located; can be a major subbasin (i.e., John Day River Basin, a subbasin of the Columbia River).
Country: Name of country in which inventory being conducted.
Location: Location of body of water, including Twp-Rge-Sect.
District: Name of district, resource area and planning unit. Pasture allotment may be used instead of planning unit.
Time: Time of inventory or water quality measurements.
Surveyor: Person or persons preparing the inventory.
Station Name and Location: If more than one site measured, indicate the location by name and site location.
Inflow: Water entering into system at time of inventory.
Outflow: Water leaving system at time of inventory. For spring, or other small bodies with limited inflow or outflow, discuss briefly under comments source and volume of water.
Area of Water: Surface area covered by the water being inventoried.
Adjacent Landform: General discussion of major geological type and form of surrounding landform.
Adjacent Vegetation: Major vegetative type; give a general discussion of type, condition and trend.
Riparian Vegetation: Indicate major species present, condition, and trend.
Fish Species: Indicate fish species present, their population and trend; discuss major use areas, especially reproduction and rearing areas.
Plankton: Indicate major phyto- and zoo-plankton species, their population levels and trends, and seasonal cycles in composition and abundance.
Water Quality: Indicate measurements and the depth taken.
Limiting Factors: Discuss factors limiting the quality and quantity of water.
Principal Land Use: Discuss principal use of adjoining lands as it affects the water system .
Use of Water: If water is being utilized directly or is being diverted or store for a specific use, indicate the use and amount.
Comments/Recommendations: Summarize conditions and indicate management recommendations.

Location maps, photographs and depth profile charts should be made on separate sheets and attached.

VIII. EVALUATION

An evaluation is a formalized method of using the information obtained in an inventory to compare one stream against another or against an ideal. The comparison is a short hand method of stating the general condition of a stream. It is often requested by managers and for environmental assessments as a short summary statement of conditions. In the past, biologists have made subjective evaluations. Because these were often challenged, a formalized system for expressing the condition evaluation was needed. Several forms were sent out for trial; from the comments received on them, a single form was roughed out for the meeting. Based on the comments at the meeting, a revision was developed, and is attached to this document.

Several questions were raised in the development and use of the evaluation form. The first one was whether or not a single form could be developed that would work for all streams. To be useful state-wide, is it necessary to have more than one form? While it is true that conditions vary between streams of the eastern Oregon arid areas and those of the moister western state, the major habitat components are the same. The fish need adequate flows of water; they need places to spawn and rear; they need a regular food supply; they need adequate water quality. Recognizing that the fish, of whatever species, have similar basic habitat needs, the problem then was to present the selection options in broad enough terms that they could cover the range of habitat types while still being specific with regards to the life component in question. At present, we are attempting to do this through the single form developed.

A second question was one of stream size; whether one form would apply to streams and rivers regardless of size. Certain elements, such as stream structure, shading and stream character, are of more interest in smaller than in larger streams. The stream orders 1 through 5, because of the limited flows, are more tied to the various elements that produce good fish habitat than are the large rivers with good flows. Again, the question is answered by saying the basic life components required by the fish will remain the same even when the basic habitat types are different.

The most basic question is, what do you use for the standard of comparison for your evaluations. In the form discussed, the standard is an ideal condition where all the components are present. It may be that such a standard is beyond the potential of some streams. The difficulty, again, is having some type of evaluation system that can be widely used, even if it does not reflect all the ramifications of existing habitats.

The attached evaluation form summarizes the major components the biologists felt were important in evaluating habitat. The categories are developed from the habitat needs of fish, and from studies which have shown relationships between specific habitat characters and stream condition. The assumption is that the person doing the rating will select the value, from 1-20, that most closely approximates the existing conditions on the scale provided. The sum of the points, which can be expressed as a total or as a percentage (maximum total would be 260 points). A rating of 65 or less (25% or less) would then be excellent;

VIII. EVALUATION (Con't)

66-130 (26-50%) would be good; 131-195 (51-75%) would be fair; and over 196 (76%) would be poor. Comparisons could then be made for the stream as a whole. Or, if desired, a single component or several components may be selected the the comparison.

STREAM EVALUATION FORM

STREAM_____ LOCATION_____ BASIN_____ INVESTIGATORS_____

TWP_____ RGE_____ SECT_____ LAT_____ LONG_____ DATE_____ R.A._____ P.U._____

STREAM FACTOR	EXCELLANT	GOOD	FAIR	POOR
1. FLOW PATTERNS	Flooding rare. Flow patterns stable, limited range; changes in flow gradual. 1 2 3 4 5	Annual flooding common. Moderate seasonal flow variability. Seasonal high and low periods 6 7 8 9 10	Flooding common, occasional flash floods. Wide annual flow fluctuations. 11 12 13 14 15	Severe, regular flash floods. Dessication may occur during dry periods. Wide annual fluctuations 16 17 18 19 20
2. TEMPERATURE RNAGE	No freezing. Temp. maximum 18°C (CW) or 27°(WW). Annual fluctuation under 10°C. Minimum 7°C(CW) or 16°C (WW) 1 2 3 4 5	No freezing, or rare. Annual fluctuation under 15°C. Ranges 5-22°C(CW) or 13-30°C(WW) 6 7 8 9 10	Surface freezing common; some anchor ice. Fluctuation under 20oC. Ranges: 1-24°C (CW), 10-33°C (WW) 11 12 13 14 15	Extensive surface of anchor ice. Annual fluctuations over 20°C. Ranges <0->27°C (CW); <7- >36°C(WW) 16 17 18 19 20
3. BANK STABILITY	Bank essentially undisturbed, firm. Strongly stabilized by roots, logs or rocks over 12" 1 2 3 4 5	Some bank breaking or erosion, erosion mainly higher flows. Roots, logs, rocks over 12" common. 6 7 8 9 10	Bank breaking or erosion common even at low flow, although most severe high flow. Some logs, roots, rocks over 6" present. 11 12 13 14 15	Extensive breaking, erosion, common at low flow, severe at high flow. Little or no rock, log, or vegetative protection 16 17 18 19 20
4. RIPARIAN DIVERSITY AND COVER	Cover over 90%; shade 80% or more, riparian vegetation highly diverse with several levels. Good woody plant development. 1 2 3 4 5	Cover over 80%; shade over 70%; vegetation moderately diverse with several levels. Woody vegetation common. 6 7 8 9 10	Cover over 50%; shade over 40% Fair diversity; at least two levels present; woody vegetation present. 11 12 13 14 15	Cover under 50%; shade under 40% Little diversity; only one level moderately developed. Woody vegetation rare or absent. 16 17 18 19 20
5. POOL QUANTITY AND QUALITY	Over 25% of channel pool; length or width 2x average stream width; depth over 20% average stream width; cover abundant. 1 2 3 4 5	13-25% channel as pool; length or width less than 2x average stream width; depth 10-20% of ave. stream width; cover ample. 6 7 8 9 10	5-12% of channel as pool; length or width equal to ave. stream width; depth 5-10% of ave. steam width; some cover. 11 12 13 14 15	Less than 5% of channel width as pool. Greatest length or width, depth less than 5% of ave. stream width. Little or no cover. 16 17 18 19 20
6. SPAWNING AREA	Over 25% of channel useable for spawning. No migration blocks 1 2 3 4 5	13-25% of channel useable for spawning. No migration blocks, or only at extreme flows. 6 7 8 9 10	5-12% of channel useable for spawning. Migration open at least part of time 11 12 13 14 15	Under 5% of channel useable for spawning. Migration routes often obstructed. 16 17 18 19 20
7. REARING AREAS	Nursery and rearing areas abundant Present all year. 1 2 3 4 5	Nursery and rearing areas common present all season 6 7 8 9 10	Nursery and rearing areas present, but limited 11 12 13 14 15	Nursery areas and rearing areas rare, seasonal. 16 17 18 19 20
8. BOTTOM MATERIAL	Bed over 80% rocky material 2" or more. Sediments only in back areas, deep pools. 1 2 3 4 5	Bed material 40-75% rocky material over 2". Sediments in quiet areas, abundant in pools. 6 7 8 9 10	Bed material 15-40% rocky material over 2". Sediments cover bed in most quiet areas. 11 12 13 14 15	Bed material over 2" less than 15%. Bottom covered with sediments in all but fast water. 16 17 18 19 20
9. RIFFLE/RAPIDS	Stream over 60% riffle or rapid 1 2 3 4 5 6	Stream 50-60% riffle or rapids. 6 7 8 9 10	Stream 25-50% riffle or rapids 11 12 13 14 15	Stream under 25% riffle or rapid 16 17 18 19 20
10. GRADIENT	Gradient 3% or less 1 2 3 4 5	Gradient 4-7% 6 7 8 9 10	Gradient 8-12% 11 12 13 14 15	Gradient over 12% 16 17 18 19 20
11. DISSOLVED AND SUSPENDED MATERIAL	TSS 0-10 mg/l; turbidity 0-5 units, TDS under 500 mg/l Conductivity under 500; during normal flows; rarely exceeds during high flows. 1 2 3 4 5	TSS 10-25 mg/l; turbidity 5-20 units; TDS 500-750 mg/l; Conductivity 500-1000; during normal flows; often exceeds values during high flows. 6 7 8 9 10	TSS 25-100 mg/l; turbidity 20 to 50 units; TDS 750-1300 mg/l; Conductivity 1000-1750; during normal flows; often exceeds during high and low flows. 11 12 13 14 15	TSS over 100 mg/l; turbidity over 50 units; TDS over 1500 mg/l; Conductivity over 1750; during normal flows; frequently exceeds during high and low flows. 16 17 18 19 20
12. CHANNEL STABILITY	Channel well-defined, ample for all but highest flow. Less than 5% of channel affected by scouring or deposition. Few or not gravel bars or flats. 1 2 3 4 5	Most of channel well-defined. Ample for normal flow, some flooding. 5-30% affected by scouring or deposition. Some channel spread, bar formation. 6 7 8 9 10	Main channel defined; some channel spreading and shifting. 30-70% affected by scouring or deposition. Pools silted in. Flats and bars common. 11 12 13 14 15	Channel poorly defined, unstable. Over 70% bed actively scouring or depositing. Channel, pools shallow. Extensive flats and bars. 16 17 18 19 20
13. STREAM STRUCTURE DIVERSITY	Tree limbs and boles, large boulders common, evenly distributed. Diversity of habitats, cover abundant, stable. 1 2 3 4 5	Tree limbs, boles, boulders & large rocks fairly common, usually evenly distributed, stable. Cover adequate; several Habitat types. 6 7 8 9 10	Some limbs, boles, boulders, large rock; uneven distribution. Few different habitats; limited cover. Structure often shifts. 11 12 13 14 15	Woody or rock structure limited or absent, distribution random. Unstable. Little or no cover. Little or no habitat diversity. 16 17 18 19 20

IX. HABITAT CLASSIFICATION

One topic discussed only briefly was habitat classification. There is an expressed need in the Bureau for a system of habitat classification that includes aquatic habitat. The 6602 manual detailed standard habitat sites (SHS) for wildlife, based on soil and vegetation. There are comments on aquatic habitats included, but the system in 6602 is not useable. The Bureau would like to expand the SHS's to include aquatic habitat, but to date has not been able to devise a descriptive system for classifying aquatic habitats.

The basis of the SHS descriptions is the use of key elements. When certain key elements are present, -for wildlife these are soil and vegetation types- then it is expected that certain wildlife species may be present. It is assumed that the conditions that produce the key elements are also the same conditions that produce the necessary factors for a certain type of wildlife to live. That does not mean that the associated wildlife species will be present in each SHS, but only that conditions are adequate for habitat for the species to be available.

One difficulty with classifying the aquatic habitat is the integration of the aquatic system. To a much greater degree than for terrestrial wildlife, the aquatic habitat is a function of the entire ecosystem, and not just conditions at a certain location. What occurs above a particular point in a stream can influence the quality of the habitat at that point. As a result, the nature of the habitat in a particular location is really the summation of the influences above that point. The problem in developing an aquatic habitat classification system has been to define characteristics that take into account the influences above the area in question. Several attempts have been made to develop a classification system, but these have been effective only on limited areas.

At the meeting, the need for a classification system was presented, but little discussed. Some discussion was held with individuals on possible approaches, but no system was developed or proposed. The discussions that were held centered on using the concept presented in the evaluation section under which streams having similar characteristics are grouped together. The basic theory is that, for a given set of conditions, a similar type of habitat will develop. The geological and hydrological conditions are going to place the limits on the potential habitat. Within the basic geological and hydrological conditions, land form, erosion potential, gradient and elevation, and other factors will interact to produce a certain type of habitat. Having similar conditions in two areas should produce a similar type of habitat.

Within the boundaries, however, there can be considerable variability. The theory of a classification system is that, given a particular set of elements, the same general type of habitat will develop. For example, in granitic mountains with snow much of the year, the basic stream may be a steep-gradient stream within a narrow cayon, with water running cold and peaking with a late spring runoff. Lowland or warmwater fish would not be expected to develop. Undistrubed, a population of coldwater fish (trout) would be expected to exist. Variation in some factors, such as gradient and pool/riffle ration, can influence the size of the population. Actions in the drainage, for example road building and mining,

may upset the stable conditions, introducing silt into the system, and altering flow patterns. The trout population would then change to reflect the alterations. The classification system would then express the potential of the stream based on the basic conditions and key elements. The evaluation system, discussed earlier, would evaluate the conditions following the mining in terms of the actual potential for that location. The range of potential conditions, and the limits of the impacts, would be dictated by the boundaries of the system as defined by the basic hydrologic and geologic type.

The following is not meant to be a scheme for developing a habitat classification system, but is given as one approach that might be considered. It has two parts; the marine is taken from the U.S. Fish and Wildlife Service wetlands inventory. The freshwater portion is broken into four subgroups, which are followed by some factors that might be used in developing a standard habitat site classification system for the aquatic habitats.

I. Marine
   - A. Oceanic
     - Neritic
     - Pelagic
     - Bathypelagic
   - B. Onshore
     - Intertidal - rocky, unconsolidated, reef, aquatic bed
     - Subtital - rocky, unconsolidated, reef, aquatic bed
   - C. Estuarine
     - Subtital - rocky, unconsolidated, reef, aquatic bed
     - Intertidal - rocky, unconsolidated, reef, flat, beach/bar, emergent, forested wetland, scrub wetland

II. Freshwater
   - A. Point Source
     - Seep - CW/WW, saline, landform, type of location
     - Spring - CW/WW, saline, landform, type of location
   - B. Impoundment
     - Perennial, intermittent, bottom material, depth/area, shoreline development, WW/CW, landform, water budget
   - C. Lacustrine - origin, landform, area/depth, shoreline development, CW/WW, bottom material, water budget
   - D. Riverine - landform, geologic/soil type, stream order, gradient/elevation, CW/WW, sinuosity, bottom material, flow patterns, climate, water quality

X. INVENTORY SUMMARY (URA)

Once the inventory has been conducted, the information needs to be summarized into a format where it can be used in the Bureau planning system and where it is available to the public. The current process is the Unit Resource Analysis, or URA. There has been some confusion over the purpose of the URA. It is a document that is to summarize all the information obtained during the inventory of a resource. This summary is to be used for developing management recommendations. However, the URA is more than a planning document; it is also the method the Bureau has selected for presenting a summary of the resource to the public, and is essentially the document by which we describe what resources are found on the public lands to the public.

All districts that have been into the URA process have had difficulties with the format. At the meeting, the general consensus was that the information requested was sound, but that they had trouble using the current manual format for presenting the information. One result was the use of different formats; each URA that has been presented during the last two years has had a different format. There have been some disagreements between districts and state office personnel over the format that should be used. The following format is an attempt to summarize the comments given at the meeting and in previous discussions on the general format desired.

Several general comments on this format:
First; it was felt more convenient to combine step 2 and step 3 into a single step, discussing the availability of habitat together with condition and trend rather than to duplicate much of the information.
Second; the species summary and the habitat summary need to be clearly separated, with more emphasis given to the habitat summary.
Third; the need was expressed for some kind of table outline or table headings rather than leaving it up to each individual to try and determine what tabulations were needed.

Wildlife Life Histories and Habitat Requirements

Summarize the life history and habitat requirement information as requested in Manual Section for the important wildlife species. This summary will cover data collected in the inventory and evaluation process. If any component of the URA wildlife section does not apply in specific instances, it should be listed as N/A only. Storage of actual inventory information will be in accordance with Manual Section .

Aquatic Species. Include all wildlife which live entirely within or that depend on aquatic environments for their major life functions.

Overlay Include all wildlife habitats identified in the aquatic wildlife habitat area. Circumscribe wildlife habitat areas and habitat components in the following manner: disregard land ownership; if the habitat of a species is widespread, do not routinely circumscribe the entire planning unit, but make notation in the legend; for all wildlife habitat circumscribed on the overlay, interrupt the line at appropriate intervals and insert the appropriate code letter symbol.

Designate all important habitat areas. Consider all streams, lakes, estuaries, reservoirs, springs and shorelines which are known to produce fish or which have aquatic habitat. Draw in springs, streams, circumscribe larger reservoirs, lakes and estuaries, and use appropriate symbols for small water developments.

Indicate all crucial habitat within the above designated areas. Certain species uses at specific periods in the life cycle may warrant designation of particular sites as crucial; for example, spawning gravels for anadromous fish, important nursery and marine areas, habitat for sensitive species, or habitat qualifying for ACEC. Number each crucial area and include in the legned and key to the narrative. Preface each number with the species designation, e.g., TR-1 for trout crucial area 1. Areas of critical environmental concern should be number and designated by the code ACEC.

Identify all special wildlife use areas withdrawn or officially designated for aquatic wildlife species; e.g., special reservoirs or watersheds set aside for propagation of an aquatic species or an official refuge. Include all areas officially designated as critical habitat under the endangered species Act. Identify each by its special designation number and/or title.

Outline and crosshatch any areas known to have serious conflicts between aquatic habitat and other existing uses. Key outlined area to narrative.

Tabulation. Tabulate information on wildlife species, trends, population levels and habitat requirements. All fish species and other important aquatic species should be included in the tables.

Population Status:
(The following heads may be used:)

SPECIES NAME	HABITAT PREFERENCE	STATUS
Use both common name and scientific name	CW=cold water	N=native
	WW=warmwater	I=introduced or exotic
	A =anadromous	E=endangered
	M = marine	T=threatened
		S=sensitive

Population Abundance and Trend:
(The following form may be used:)

Down the right hand column list the individual streams or sections of streams.

Across the top, list the major species; for each stream under each species, indicate its abundance and trend as follows:

A=abundant	0=population static
C=common	+=increasing
R=rare	-=decreasing
P=present, status unknown	

For a stream with a stable, abundant population of a species, the code would be A0; if it were common, but in a population decline, the code would read C-.

Habitat Requirements:
(Summarize basic habitat requirements by species; following categories may be used:)

SPECIES	TEMPERATURE PREFERENCE	HABITAT TYPE	REPRODUCTION	FOOD	OTHER
List names of aquatic species	Summarize temperature preferences, showing reproductive needs if different	Indicate basic habitat types: i.e., lakes, fast water, etc.	Summarize reproductive behaviour, emphasize habitat needs.	Summarize basic food supply	Summarize other needs, i.e., water quality limits, cover needs, etc.

Species Utilization. summarize species utilization, indicating effort and harvest for the commercial and sport fisheries, and for non-consumptive uses, for appropriate aquatic species. If possible, summarize utilization by pounds of catch, amount of effort (angler-days, etc.) and financial value of the catch. Include information on stocking programs as to level and location.

Other. If there is additional tabular information to support the narrative on species, include here. Title each table to readily identify its intent, content and source.

Narrative. Summarize the information for each species or group of species as it applies; the information will be based primarily on the planning area as developed but may extend to other areas as needed to develop the information. Discussions may be by species for the whole planning area, or may be by species in each stream system as needed.

Population History: Interpret the data as summarized in the tables as to present and former species distribution, population trends, introduction, reintroductions, or terminations of species. Include any other information relating to wildlife history in the planning area as appropriate.

Population condition and trend: summarize the existing situation for the aquatic species populations in the planning area. Describe the present conditions and factors causing problems or which present limitations to any species or group of species. Discuss the trend data and the reasons for the trends. Include conflicts and interrelationships between species, and problems as they relate to life functions. Discuss the effects of existing habitat conditions. Indicate which factors are limiting, and whether all populations or portions of them are so limited. Indicate which season of use or life function, such as breeding, spawning, rearing, etc., is limited.

Life History and Seasonal Use: Summarize life histories of major species. Include species use areas during the year and data pertaining to uses such as preferred habitat types, food preferences and source, cover needs, temperature and water quality preferences, reproductive behaviour and needs, migratory movements and routes.

Special Use Areas: Describe in detail all areas withdrawn or designated especially for a given species. Include particularily officially designated critical habitat. Discuss any special habitat requirements for officially listed threatened or endangered species, and for species qualifying for sensitive species designation under the Manual 6840 requirements.

Harvest: Discuss the harvest, commercial, sport and non-consumptive, as summarized in the tables. Include information on locations, amount of effort, and regulations. Include information on state population management efforts, including stocking programs. Detail any non-consumptive uses, including uses for research and scientific needs.

Conflicts: Summarize existing conflicts which now exist among aquatic species and with other resource uses in the planning area.

Aquatic Habitat. Summarize the presence and condition of all aquatic habitat within the planning area. This includes not only all habitat with a resident fish population, but also habitat used seasonal by fish, or which have important non-fish populations of aquatic animals and plants.

Overlay. Aquatic habitat was summarized on the overlays discussed under the aquatic species section.

Tabulations. Tabulate information for aquatic habitat, indicating the amount of habitat present, condition and trend, and any problems or conflicts identified during the inventories. The following are major topics, with possible tabular format that may be used.

Habitat Availability:
(Indicate aquatic habitat present, ownership and extent.
The following tabular headings may be used:)

NAME	LOCATION/SECTION	OWNERSHIP BLM OTHERS (SPECIFY)	PUBLIC ACCESS
List names of waters found in the planning area, as a whole or in sections as inventoried.		Summarize ownership of the water listed by miles or acres.	Indicate whether public access is available or not.

Habitat Description. The tables can summarize the various inventory elements by stream or other water inventoried. Any arrangement may be made that will suit the need. Because of the lengthy list of elements, not all will fit onto a single form. One approach would be to separate the inventory information into component groups and prepare tables for each. The following is one approach.

GEOMORPHOLOGY AND VEGETATION

LANDFORM	EROSION PORTENTIAL	RIPARIAN VEG. TYPE	RIPARIAN VEG. COND.	RIPARIAN COVER	SHADE	UPLAND VEG. TYPE	AQUATIC VEGETATION

Information would be taken directly from the inventory forms.

WATER QUALITY, HYDROLOGY, CLIMATE

FLOW: MIN. & MAX.	CONDUCTIVITY TDS	TURBIDITY TSS	WATER TEMP. MAX. & MIN.	MACROINVERTEBRATES BIO MASS	DIVERSITY	COLIFORM TOTAL FEC.	OTHER

Information is taken from inventory forms.

STREAM CHARACTER

STREAM ORDER GRADIENT	% POOL	% RIFFLE, RUNS, RAPIDS	% STREAM STRUCTURE	MAJOR BOTTOM TYPES, %	MEAN WIDTH	MEAN DEPTH

Information taken from inventory forms.

Habitat Status and Trends:

(This is a summary of the status of the habitat, based on the evaluation. In this case, the evaluation would be the evaluation form as developed, or any other system used. The information may be summarized as follows:)

NAME	LOCATION	EVALUATION	TREND
The name and location refer to the water and the particular section covered.		A single evaluation figure might be used, such as the final figure from the evaluation form. A more useful approach would be to break down the categories and give values for each.	Trend of habitat at current time, if known.

Habitat Problems and Conflicts:

(This table would summarize the habitat conflicts and any problem situations encountered during the inventory. This may refer to the conflicts with other uses, to problems from natural causes, or any other identifiable situation that is degrading or threatening the quality or quantity of the aquatic habitat. A possible summary table:)

NAME	LOCATION	PROBLEM/CONFLICT	DIMENSIONS	TREND

This information is taken from the inventory forms.

Other Habitat Situations: Any other situations encountered, or information that deserves consideration, may be summarized as needed.

Narrative: The narrative should explain the current availability of habitat, its condition, changes whch have taken place and the causes, current trends, and any special situations that were encountered. The narrative should summarize information presented in the tables and on the overlay.

General Description of Aquatic Ecosystem: The narrative should give a general description of the overall aquatic ecosystem, discussing the geological and hydrological factors that control channel development and flow patterns. Indicate general development of flowing and standing water systems and their distribution and land ownership patterns.

Habitat History: Describe, if known, the general historical changes that have taken place in the aquatic ecosystem. If possible, summarize impacts of past activities on the habitat.

Current Conditions and Trends: Discuss the current condition of the aquatic habitat, using information from the inventory to demonstrate condition. Show how this condition relates to potential for the habitat. If known, discuss trend of habitat condition.

Change Agents: Describe major change agents that have altered the structure and condition of the aquatic habitat. Indicate those change agents which are operational at the present time. Particular attention should be given to current and past BLM management actions.

Specific Habitat Situations: Discuss specific habitat situations, indicating problem areas, habitat conflicts, use conflicts, or any other situation which is of interest in management of the aquatic habitat. Indicate nature of situation, extent of the situation, and trends. General habitat opportunities or needs may be addressed as they relate to the situations.

Narratives should be based on an ecosystem concept. Discussions of habitat conditions, problems and change agents need not be restricted to public lands, but should include information on other adjoining lands as needed to explain the situation on public lands. Discussions may be developed for the planning areas as a whole (as, for example, discussions of historical changes), or by individual stream sections, as needed.

XI. PLANNING PROCEDURES

One of the principal purposes of the inventory is to provide input into the Bureau planning system. The inventory is required if site-specific information is needed to develop management recommendations. It is no more logical to try and manage wildlife habitat without inventories than to lay out timber sales, development AMPs or prepare mineral leases without inventory information. It is one of the resources that BLM manages, and, like all resources, shows variability from place to place. It is through field inventories that information on conditions, habitat needs and potential solutions is developed.

The current procedure for introducing recommendations into the planning system is through the MFP process. The Bureau is to change to an RMP process, but at this time information is not available on RMP procedures. Some discussions were held among the biologists on recommended MFP format changes. One of the recommendations was to combine the Step 4 URA and Step 1 MFP into a single step. All agreed the basic types of information requested in the Step 4 URA were good, but felt the discussions called for in Step 4 needed to be carried over better into the recommendation phase, now done as Step 1 MFP. Essentially, the revised recommended format would combine Step 4 URA and Step 1 MFP, and include as part of the discussion much of the analysis now done in the Socio-Economic Profile.

Under the revised concept, the first part of the input would involve a discussion of the general results of the inventory. This would summarize problems identified and management opportunities recognized during the inventory phase. This would be a general discussion of the types of opportunities and needs. Using the Step 4 URA topics, the opportunities and needs would fall under the expansion, preservation, or improvement headings.

The second part would be a discussion of possible actions. Again, this would be a general discussion. For example, under grazing systems, it would be a general discussion of the types of actions or grazing systems that could be used to achieve desired goals with the aquatic habitat. Opportunities and options would be presented for the problems identified in the first part.

The third part would be a discussion of specific waters. The general discussions on needs and options would be extended to cover specific waters. Each water would be covered by a short discussion of specific needs and options. If more than one option would be feasible, then each would be discussed. The pros and cons of each option for each site would be presented. Then, from the options available, a single recommendation would be made by the biologists. The particular problems and options for each stream would be summarized on an overlay and in tabular form.

The fourth part would be an evaluation of the different options. This is an extension of the discussion of the pros and cons of each option. The expected changes for each option, and for the recommended action, would be discussed. Specific habitat factors and species would be used. This is where information is needed from a strong data base. If a good data base is available, it would be possible, by comparing results of studies and other inventories, to make

predictions of changes in specific habitat factors and aquatic animal populations. This information would be tabulated for each water.

The fifth step would be to do the socio-economic analysis on the expected impacts. Again, if an adequate data base is available, this information can be generated by comparing with previous work. The socio-economic values could then be site-specific, rather than prepared as a summary for the resource as a whole. This would help to identify areas of particular value or concern.

In most respects, the basic components of this proposed format are already present. However, it was the feeling that, by fragmenting the different aspects into separate documents, the continuity is lost. In addition, it does not permit using discussions developed elsewhere as part of other discussions. The revised format would permit bringing together the opportunities, options, recommendations and analysis into a single document. This permits a more realistic appraisal of options, and provides for an integrated approach to analyzing impacts.

Several problems were identified with trying to implement this system. One was the lack of an adequate data base to make necessary comparisons and correlations. One reason is that inventories in the past have not been done in a uniform manner. As a result, different things were inventoried in different locations, without consistency even for a single factor. As a result, the erosion potential, for example, may be different between two locations. Secondly, many aspects of the inventory have not been taken. One notable lack is in information on abundance and composition of fish populations that would permit relating different habitat conditions to different fish populations. A uniformity of data acquisition would permit large-scale analysis and comparison from a variety of locations and conditions.

A second problem is in computing and analyzing the data. The most obvious method would be to use computers. However, the storage and retrieval capability for wildlife is not scheduled to go on line for several years. At the present time, analytical capability is not included in the computer program. Much of the evaluation, development of options, prediction of impacts and socio-ecenomic analysis can be done by computer if the capability is available.

A third problem is the lack of capability under current socio-economic procedures to consider non-consumptive uses. Wildlife resources have important non-consumptive uses, the most obvious of which is the preservation of endangered species. Yet, when analyses are being made of the economic aspects, they are based on income-generation, which essentially implies consumptive uses. Adequate consideration is not being given to the non-consumptive aspects of the resouce.

A fourth problem is the need to better relate impacts to specific habitat components. Some work has been done by other groups and agencies examining specific habitat components, but as yet there is insufficient work to show the relationship between habitat management, utilization of competing resources, quality and quantity of specific habitat components, and the resulting aquatic organism population composition and abundance.

XII. GLOSSARY

AQUATIC VEGETATION: Emergent and submergent vegetation in or along the edge of a body of water. Includes algae.

BANK CONDITION: The height, stability and composition of the bank. Of particular interest is the exposed areas or those in danger of possible erosion or sloughing. Condition compares situation with potential for that location.

BOULDER: Any rock over one foot in diameter. In inventory, two sizes recognized; large boulders being over three feet in diameter, small boulders one to three feet.

CASCADE: Swift current, many exposed rocks and boulders; much surface agitation standing waves; drops of 3-6 feet common.

CHANNEL STABILITY: Resistance of channel to scouring and deposition. Indicated by the compactness of bottom, presence of sand and gravel bars, the size of the bottom material, pool development, and bottom color.

COBBLE: Cobbles are rocky materials six to 12 inches in diameter.

COLIFORM: Coliform refers to tests for the presence of bacteria based on the test for E. coli bacteria. Two tests are often run, total and fecal. Both are expressed as Most Probably Number (MPN), with the MPN being the number of colonies to develop in a 24 hour test from a 100 ml water sample. Total coliform tests for all coliform, regardless of origin, while the fecal tests for those bacteria from warmblooded animals.

COVER: Areas in the water, often associated with rocks, overhanging banks, pools, or woody material, used by fish for protection and hiding.

EROSION POTENTIAL: An expression of the potential for erosion to occure in an area, based on topography, soil and geologic type and vegetation. A recommended format for estimating potential sediment yield is the BLM 7310 procedures.

FALLS: A continuous drop of six feet or more.

GLIDE: A shallower area of a stream, similar to pools in current, but lacking in depth. Generally not useable for resting or cover, but may be important for rearing and as nursery areas.

GRAVEL: Rocky material 0.1 to 3 inches in diameter. Often broken into two sizes; small gravel 0.1-1 inch, and larger gravel 1-3 inches in diameter.

HABITAT DIVERSITY: The presence of several microhabitats within the larger aquatic habitat. Microhabitats differ in flow patterns, depth, substrate and possibly water quality and biota. Microhabitats are created by differential interaction with the landform, and the presence of structural material, such as boulders and woody material, in the stream. Different species, and a single species at different life stages, may utilize different microhabitats.

LANDFORM: The topography of the lands forming the basin of the water in question. Includes gross description, such as mountains, delta, etc.; and the more specialized topography of the immediate channel and the more specialized topography of the immediate channel and adjoining slopes.

NURSERY AREA: Because of the inability of small fish to control movement in currents, and because of the need for plankton food by fry, shallow areas with little or no current and some planktonic development are used by many of the small fish in their first weeks. These shallow, protected areas are called nursery areas.

NUTRIENTS: Chemical constituents needed for production of biota. Most often, the nitrogen and phosphate compounds are most limiting, so that tests for nutrients usually test for thse two groups of compounds.

POOL: An area with little or no current, usually with water deeper than the portions of the stream with current, and which is useable by fish for resting and cover.

RAPID: Swift current, with considerable surface agitation, some waves may be present; rocks and boulders exposed at all but high flows. Drops up to three feet.

RIFFLE: Flowing water with a low gradient. Surface may be agitated by rocks or gravel, but standing waves absent.

RIPARIAN: Riparian habitats are those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, the associated high water tables and soils which exhibit some wetness characteristics.

RUBBLE: Rocky material three to six inches in diameter.

RUN: An area of swiftly flowing water but without any agitation or waves; surface generally smooth.

SPAWNING AREA: Areas utilized by fish for deposition of eggs. Spawning areas are usually characterized by substrate, currents and any required stream structure or vegetation.

STREAM CHARACTER: A function of elevational changes and land form. Components include type of pool and flow patterns, and the substrate composition.

STREAM ORDER: A system for defining streams in terms of tributary contributions. The first order streams are those without any branches or forks, and constitute the highest channels in the drainage. A second order stream is formed by the union of two first order streams. A third order stream is formed by the union of two second order streams, and so forth.

STREAM CLASS: A system for classifying streams on the basis of their importance to fish and water resources. The highest class stream would be an important contributor to the fishery, or an important water source. Two or more classes are usually recognized.

STREAM STRUCTURE: The summation of channel and bank irregularity and rocky and woody material in the stream that provide diversity of habitat. Structure may be developed naturally through the processes involved in channel development, or as a result of rocky and woody material entering the stream.

TURBIDITY: The loss of light during its passage through water as a result of suspended or dissolved material in the water. Turbidity is not the same as sediments or disolved solids, but is simply the measurement of light penetration. It is a general indicator of sediments or dissolved solids but is not a measurement of them.

UPSLOPE VEGETATION: Vegetation on slopes adjoining the stream, above the riparian zone.

WATER BUDGET: A summation of the water entering into the basin, the water exiting the basin, and the interactions between the surface and subsurface flows.

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